Claims

1. A polypeptide having an amino acid sequence which is derived from that of the Tbp2 subunit of the transferrin receptor of an IM2169 or IM2394 type *Neisseria meningitidis* strain whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the respective reference strain, IM2169 or IM2394, as shown in ID SEQ NO 1 or 3, in particular by total or partial deletion of at least one domain of the said IM2169 or IM2394 type Tbp2 subunit, provided the first and second domains are not totally deleted simultaneously.

2. A polypeptide according to Claim 1, having an amino acid sequence which is derived from that of the IM2169 or IM2394 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the respective reference strain, IM2169 or IM2394; in particular by partial deletion of the third domain of the said IM2169 or IM2394 type Tbp2 subunit.

3. A polypeptide according to Claim 1, having an amino acid sequence which is derived from that of the IM2169 or IM2394 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the respective reference strain, IM2169 or IM2394; in particular by total deletion of the third domain of the said IM2169 or IM2394 type Tbp2 subunit.

4. A polypeptide according to Claim 2 or 3, having an amino acid sequence which is derived from that of the IM2169 or IM2394 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the respective reference strain, IM2169 or IM2394; and which contains in its entirety the second domain of the sequence from which it is derived.

5. A polypeptide according to Claim 2 or 3, having an amino acid sequence which, in addition, is derived from that of the IM2169 or IM2394 type Tbp2 subunit whose

first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the respective reference strain, IM2169 or IM2394; in particular by partial deletion of the second domain of the said IM2169 or IM2394 type Tbp2 subunit.

6. A polypeptide according to Claim 2 or 3, having an amino acid sequence which, in addition, is derived from that of the IM2169 or IM2394 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the respective reference strain, IM2169 or IM2394; in particular by total deletion of the second domain of the said IM2169 or IM2394 type Tbp2 subunit.

7. A polypeptide according to Claim 4, 5 or 6, having an amino acid sequence which is derived from that of the IM2169 or IM2394 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the respective reference strain, IM2169 or IM2394; and which contains in its entirety the first domain of the sequence from which it is derived.

8. A polypeptide according to Claim 4, 5 or 6, having an amino acid sequence which, in addition, is derived from that of the IM2169 or IM2394 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the respective reference strain, IM2169 or IM2394; by partial deletion of the first domain of the said IM2169 or IM2394 type Tbp2 subunit.

9. A polypeptide according to Claim 4 or 5, having an amino acid sequence which, in addition, is derived from that of the IM2169 or IM2394 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the respective reference strain, IM2169 or IM2394; by total deletion of the first domain of the said IM2169 or IM2394 type Tbp2 subunit.

10. A polypeptide according to Claims 2 or 3, 4 and 7, having an amino acid sequence which is derived from

that of the IM2169 type Tbp2 subunit.

11. A polypeptide according to Claims 2 or 3, 4 and 7, having an amino acid sequence which is derived from that of the IM2394 type Tbp2 subunit.

12. A polypeptide according to Claims 2 or 3, 4 and 8, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit.

13. A polypeptide according to Claims 2 or 3, 4 and 8, having an amino acid sequence which is derived from that of the IM2394 type Tbp2 subunit.

14. A polypeptide according to Claim 12, having an amino acid sequence which, in addition, is derived from that of the IM2169 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the reference strain IM2169, by deletion of all or part of the region which is the homologue of the region of the first domain of the said IM2169 type Tbp2 subunit extending from the amino acid at position 1 to the amino acid at position 281.

15. A polypeptide according to Claim 13, having an amino acid sequence which, in addition, is derived from that of the IM2394 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the reference strain IM2394, by deletion of all or part of the region which is the homologue of the region of the first domain of the said IM2394 type Tbp2 subunit extending from the amino acid at position 1 to the amino acid at position 266.

16. A polypeptide according to Claims 2 or 3, 4 and 9, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit.

17. A polypeptide according to Claims 2 or 3, 4 and 9 having an amino acid sequence which is derived from that of the IM2394 type Tbp2 subunit.

18. A polypeptide according to Claims 2 or 3, 5 and 7, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit.

19. A polypeptide according to Claims 2 or 3, 5 and 7, having an amino acid sequence which is derived from that of the IM2394 type Tbp2 subunit.

20. A polypeptide according to Claims 2 or 3, 5 and 8, having an amino acid sequence which is derived from that of the IM2169 type of the Tbp2 subunit.

21. A polypeptide according to Claims 2 or 3, 5 and 8, having an amino acid sequence which is derived from that of the IM2394 type Tbp2 subunit.

22. A polypeptide according to Claim 18 or 20, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the reference strain IM2169, by deletion of the region of the second domain of the said IM2169 type Tbp2 subunit which is the homologue of the region of the second domain of the IM2169 Tbp2 subunit extending from the amino acid in one of the positions 346 to 361 to the amino acid at position 543.

23. A polypeptide according to Claim 19 or 21, having an amino acid sequence which is derived from that of the IM2394 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the reference strain IM2394, by deletion of the region of the second domain of the said IM2394 type Tbp2 subunit which is the homologue of the region of the second domain of the IM2394 Tbp2 subunit extending from the amino acid in one of the positions 326 to 341 to the amino acid at position 442.

24. A polypeptide according to Claim 18 or 20, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the IM2169 Tbp2 subunit, by deletion of at least one of the regions of the second domain of the said IM2169 type Tbp2 subunit which are the homologues of the regions of the IM2169 Tbp2 subunit extending:

(i) from the amino acid at position 362 to the

amino acid at position 379;

(ii) from the amino acid at position 418 to the amino acid at position 444;

(iii) from the amino acid at position 465 to the amino acid at position 481; and

(iv) from the amino acid at position 500 to the amino acid at position 520.

25. A polypeptide according to Claim 24, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit, whose first, second and third domains are defined by alignment to maximum homology with the sequence of the IM2169 Tbp2 subunit, by deletion of the regions of the second domain of the said IM2169 type Tbp2 subunit which are the homologues of the said regions (i) to (iv) of the IM2169 Tbp2 subunit.

26. A polypeptide according to Claims 20 and 24 or 25, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the IM2169 Tbp2 subunit, by deletion of all or part of the region which is the homologue of the region of the first domain of the said IM2169 type Tbp2 subunit extending from the amino acid at position 1 to the amino acid at position 281.

27. A polypeptide according to Claims 3, 6 and 7, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit.

28. A polypeptide according to Claims 3, 6 and 7, having an amino acid sequence which is derived from that of the IM2394 type Tbp2 subunit.

29. A polypeptide according to Claims 3, 6 and 8, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit.

30. A polypeptide according to Claims 3, 6 and 8, having an amino acid sequence which is derived from that of the IM2394 type Tbp2 subunit.

31. A polypeptide according to Claim 1, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the reference strain IM2169; by partial deletion of the second domain of the said IM2169 type Tbp2 subunit, in particular by deletion of at least one of the regions of the second domain of the said IM2169 type Tbp2 subunit which are the homologues of the regions of the IM2169 Tbp2 subunit extending:

(i) from the amino acid at position 362 to the amino acid at position 379,

(ii) from the amino acid at position 418 to the amino acid at position 444,

(iii) from the amino acid at position 465 to the amino acid at position 481, and

(iv) from the amino acid at position 500 to the amino acid at position 520; and

which contains in their entirety the first and third domains of the sequence from which it is derived.

32. A polypeptide according to Claim 1, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the Tbp2 subunit of the reference strain IM2169; by partial deletion of the second domain of the said IM2169 type Tbp2 subunit, in particular by partial deletion of the first domain and by deletion of at least one of the regions of the second domain of the said IM2169 type Tbp2 subunit which are the homologues of the regions of the IM2169 Tbp2 subunit extending:

(i) from the amino acid at position 362 to the

amino acid at position 379,

(ii) from the amino acid at position 418 to the amino acid at position 444,

(iii) from the amino acid at position 465 to the amino acid at position 481, and

(iv) from the amino acid at position 500 to the amino acid at position 520; and

which contains in its entirety the third domain of the sequence from which it is derived.

33. A polypeptide according to Claim 32, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the IM2169 Tbp2 subunit, by deletion of all or part of the region which is the homologue of the region of the first domain of the said IM2169 type Tbp2 subunit extending from the amino acid at position 1 to the amino acid position at 281.

34. A polypeptide according to one of Claims 31 to 33, having an amino acid sequence which is derived from that of the IM2169 type Tbp2 subunit whose first, second and third domains are defined by alignment to maximum homology with the sequence of the IM2169 Tbp2 subunit, as shown in ID SEQ NO 1, by deletion of the regions of the second domain of the said IM2169 type Tbp2 subunit which are the homologues of the said regions (i) to (iv) of the IM2169 Tbp2 subunit.

35. A polypeptide according to one of Claims 10, 12, 14, 16, 18, 20, 22, 24 to 27, 29 and 31 to 33, having an amino acid sequence which is derived from that of the IM2169 Tbp2 subunit.

36. A polypeptide according to one of Claims 11, 13, 15, 17, 19, 21, 23, 28 and 30, having an amino acid sequence which is derived from that of the IM2394 Tbp2 subunit.

37. A polypeptide according to one of Claims 1 to 36, having a sequence which comprises at least 50 amino acids.

38. An isolated DNA fragment coding for a polypeptide according to one of Claims 1 to 37.

39. A pharmaceutical composition for inducing an immune response against *N. meningitidis*, comprising as active principle at least one polypeptide according to one of Claims 1 to 37.

40. A pharmaceutical composition according to Claim 39, which comprises as active principle at least one first and at least one second polypeptide according to one of Claims 1 to 37; the said first polypeptide having a sequence which is derived from that of an IM2169 type Tbp2 subunit, and the said second polypeptide having a sequence which is derived from that of an IM2394 type Tbp2 subunit.

41. A pharmaceutical composition according to Claim 40, in which the said at least one second polypeptide is according to one of Claims 11, 13, 15, 19, 21, 23, 28 and 30.

42. A pharmaceutical composition according to Claim 41, in which the said at least one second polypeptide is according to one of Claims 11, 19, 23 and 28.

43. A pharmaceutical composition according to Claim 40, 41 or 42, in which the said at least one second polypeptide has an amino acid sequence which is derived from that of the IM2394 Tbp2 subunit.

44. A pharmaceutical composition according to one of Claims 40 to 43, in which the said at least one first polypeptide is according to one of Claims 10, 12, 14, 18, 20, 22, 27 and 29.

45. A pharmaceutical composition according to Claim 44, in which the said at least one first polypeptide is according to one of Claims 10, 18, 22 and 27.

46. A pharmaceutical composition according to one of Claims 40 to 43, in which the said at least one first polypeptide is according to one of Claims 31 to 34.

47. A pharmaceutical composition according to one of

Claims 40 to 43, in which the said at least one one first polypeptide is according to Claim 16.

48. A pharmaceutical composition according to one of Claims 44 to 47, in which the said at least one first polypeptide has an amino acid sequence which is derived from that of the IM2169 Tbp2 subunit.

49. A pharmaceutical composition according to Claim 47, which comprises at least one third polypeptide which is according to Claim 16.

50. A monoclonal antibody:

(i) capable of recognizing an epitope present in the first domain of an IM2169 or IM2394 type Tbp2 subunit; the said epitope having a sequence homologous to that present in the first domain of the Tbp2 subunit of the strain IM2394 and selected from YKGTW, EFEVDFSDKTIKGTL, EGGFYGPKGEEL and AVFGAK; and optionally,

(ii) incapable of recognizing the epitope present in the third domain of the said IM2169 or IM2394 type Tbp2 subunit, whose sequence is homologous to that of the epitope of the first domain which is recognized.

51. A monoclonal antibody according to Claim 50,

(i) capable of recognizing the region present in the first domain of an IM2169 or IM2394 type Tbp2 subunit whose sequence is homologous to the sequence EGGFYGPKGEEL present in the first domain of the Tbp2 subunit of the strain IM2394; and optionally,

(ii) incapable of recognizing the epitope present in the third domain of the said IM2169 or IM2394 type Tbp2 subunit, an

epitope equivalent to the one which is recognized, whose sequence is homologous to the sequence SGGFYGKNAIEM present in the third domain of the Tbp2 subunit of the strain IM2394.

52. A monoclonal antibody according to Claim 51,

(i) capable of recognizing the epitope GFYGPK present in the first domain of a Tbp2 subunit of the strain IM2394; and

(ii) incapable of recognizing the equivalent epitope present in the third domain of the said IM2394 Tbp2 subunit.

53. A pharmaceutical composition for treating an *N. meningitidis* infection by passive immunotherapy, which comprises as active principle a monoclonal antibody according to one of Claims 50 to 52.